



# Institute for Laser Science and Applications

Created in 1996, the mission of the Institute for Laser Science and Applications (ILSA) is to foster university collaborations that have the potential to enhance the vitality of high-energy-density (HED) science research using laser facilities at LLNL. ILSA ([ilsa.llnl.gov](http://ilsa.llnl.gov)) supports academic collaborations on the application of high-intensity, high-energy lasers in areas that include laser-plasma physics, the study of matter under extreme conditions, and ultra-short, laser-pulse interaction physics.

As part of its mission, ILSA oversees access for students and faculty to LLNL experimental laser facilities, such as the Jupiter laser facility ([jlf.llnl.gov](http://jlf.llnl.gov)) and, eventually, the National Ignition Facility ([lasers.llnl.gov](http://lasers.llnl.gov)). University involvement in these laser facilities assists and enhances the scientific environment at LLNL and creates a forward-looking research effort that provides strategic benefit to both the LLNL and the university communities.

ILSA's outreach to the university community also includes the organization of conferences and workshops in topical areas of common interest to the HED science community. ILSA's work is carried out in collaboration with LLNL colleagues from various programs having HED science research topics and with faculty colleagues from University of California campuses and other universities with unique HED science capabilities (theoretical, computational, and experimental).

## ILSA HED Science Research

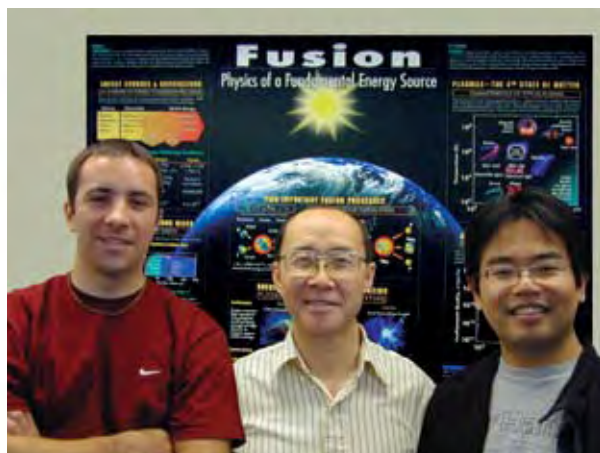
An important element of ILSA's research in high-intensity, laser-plasma interactions is the "Exploratory Research in the Institutes" (ERI) category within LLNL's Laboratory Directed R&D (LDRD). ILSA's ERI projects include the use of the Jupiter laser facility with a minimum of one faculty co-PI and one graduate student and/or postdoctoral researcher. Current ERI projects include topics in ICF Fast Ignition, Laser Plasma Amplification techniques, Plasma X-ray scattering techniques, and general HED Physics experiments. The ERI project PIs reside in the Physical Sciences and NIF/Photon Science Directorates.

Other elements of ILSA's research are the academic research partnerships that include Faculty Sabbaticals, the UC Office of the President Collaborations, and the University Education Partnerships Program (UEPP). UEPP supports Ph.D. student dissertation studies that are aligned with the mission needs of LLNL. The dissertation studies of particular interest to ILSA are those that include experimental activities and theoretical/computational modeling that will enhance the quality of HED science research with ultrahigh intensity lasers at LLNL's Jupiter laser facility and eventually NIF.

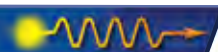
## ILSA Sponsorship of Workshops

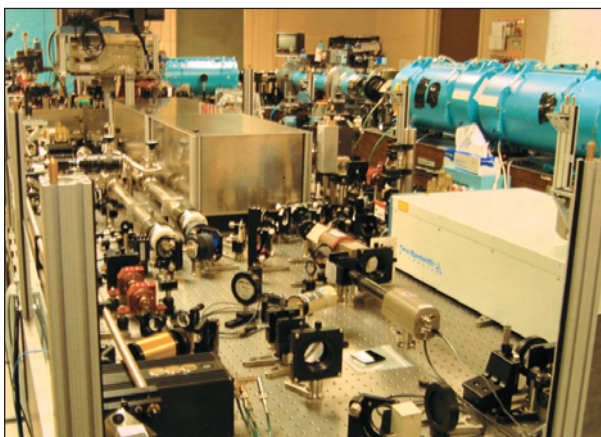
Because of ILSA's support of HED research throughout the U.S. academic community, ILSA is part of a multi-university Fusion Science Center for Extreme States of Matter that is centered at the University of Rochester ([fsc.ile.rochester.edu](http://fsc.ile.rochester.edu)). The UR Fusion Science Center is funded at approximately 1M\$/year for 5 years by DOE's Office of Fusion Energy Sciences (OFES). ILSA's role in the Center includes helping organize workshops and summer schools for graduate students, such as the Summer School in HED Physics (2005 at the UC Berkeley Clark Kerr Campus and 2007 at UC San Diego).

Previous workshops co-sponsored by ILSA include the Short-Pulse Laser Matter Computational Workshop ([ilsa.llnl.gov/lasermatter/](http://ilsa.llnl.gov/lasermatter/)) and the International Conference on Ultrahigh Intensity Lasers ([www.llnl.gov/icuil/](http://www.llnl.gov/icuil/)). The Computational Workshop concentrated on the computational and theoretical aspects of short-pulse laser-plasma interactions, and the Conference on Ultrahigh Intensity Lasers brought together in one venue both the



*Professor Edison Liang from Rice University accompanied by grad student Dan Kocovski (left) and postdoc Kiochi Noguchi (right), took a six-month sabbatical at LLNL studying astrophysics applications of intense lasers.*





*Unique “Chirped Pulse” front end added to Janus.*

the developers and users of the latest ultrahigh intensity laser technology to discuss critical issues related to furthering this technology.

### **ILSA, University of California and HED Science**

ILSA was involved in the University of California-sponsored 2005 Forum on High Energy Density Science and Ultrafast Science. Participants represented SLAC, LLNL, LANL, LBNL and UC campuses. The forum was an initiative on the part of the University of California Office of the President to explore opportunities that could help define the direction of these two fields through the formation of alliances among the UC campuses and UC-affiliated national laboratories. The outcome of the forum provided the necessary background information to help create a UC plan for the next few decades of research in High Energy Density Science and Ultrafast Science.

As stated by UC, “This plan will be used to generate new funding for programs involving multi-campus (University and National Laboratories) collaborative projects. It is expected that these projects, involving graduate students, postdoctoral fellows and principal investigators, will be the fundamental elements of a campaign to keep the UC campuses and labs at the forefront of High Energy Density Science and Ultrafast Science for foreseeable future. Therefore, the goal is to develop one or more major initiatives with the State and Federal Governments as well as private foundations, to fund research outlined in the plan.”

### **ILSA, LLNL and HED Science**

HED science has been identified as one of the thematic planning areas for LLNL’s long-term Science & Technology (S&T) investment strategy. HED S&T along with Stockpile S&T form the cornerstones of the



*Titan laser added to the LLNL Jupiter facility.*

Laboratory’s nuclear weapons (stockpile stewardship) mission. Thus HED S&T is an integral component of the Lab’s national security missions (stockpile stewardship, nonproliferation, and homeland security). By combining the existing laser capabilities within LLNL’s Jupiter laser facility with the future capabilities of the National Ignition Facility, the Laboratory will continue to be the provider of unique, world-class S&T capabilities in HED science.

LLNL HED S&T capabilities will continue to attract researchers not only from national laboratories but from universities as well. The next few years will see the completion of the NIF laser leading to ignition and HED science experiments. Starting with LLNL’s Nova laser, there has been an active university use of the Laboratory’s unique high-energy, short-pulse laser facilities. The academic use of the Jupiter laser facility provides a bridge for connecting the previous Nova use program to a future university-use program with NIF. ILSA will continue to help foster HED S&T collaborations between LLNL researchers and academic researchers, especially those involving Jupiter and NIF.

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